INTELLIGENT ROBUST CONTROL SYSTEM FOR MOTORCYCLE USING SOFT COMPUTING OPTIMIZER

Abstract

A Soft Computing (SC) optimizer for designing a Knowledge Base (KB) to be used in a control system for controlling a motorcycle is described. In one embodiment, a simulation model of the motorcycle and rider control is used. In one embodiment, the simulation model includes a feedforward rider model. The SC optimizer includes a fuzzy inference engine based on a Fuzzy Neural Network (FNN). The SC Optimizer provides Fuzzy Inference System (FIS) structure selection, FIS structure optimization method selection, and teaching signal selection and generation. The user selects a fuzzy model, including one or more of: the number of input and/or output variables; the type of fuzzy inference; and the preliminary type of membership functions. A Genetic Algorithm (GA) is used to optimize linguistic variable parameters and the input-output training patterns. A GA is also used to optimize the rule base, using the fuzzy model, optimal linguistic variable parameters, and a teaching signal. The GA produces a near-optimal FNN. The near-optimal FNN can be improved using classical derivative-based optimization procedures. The FIS structure found by the GA is optimized with a fitness function based on a response of the actual plant model of the controlled plant. The SC optimizer produces a robust KB that is typically smaller that the KB produced by prior art methods.